



Constellation Program:

America's Fleet of Next-Generation Launch Vehicles

The Ares I Crew Launch Vehicle

NASA is designing, testing and evaluating hardware and related systems for the agency's Ares I crew launch vehicle—the rocket that will carry a new generation of space explorers safely and reliably into orbit.

Under the goals of NASA's exploration missions, Ares I is a chief component of the cost-effective space transportation infrastructure being developed by NASA's Constellation Program. These transportation systems will carry human explorers back to the moon, and then onward to Mars and other destinations in the solar system.

The Ares I effort includes multiple project element teams at NASA centers and contract

organizations around the nation, and is led by the Exploration Launch Projects Office at NASA's Marshall Space Flight Center in Huntsville, Ala. Together, these teams are designing and developing vehicle hardware, evolving proven technologies, and testing components and systems. Their work builds on powerful, reliable Saturn rocket and space shuttle propulsion elements, as well as nearly a half-century of NASA spaceflight experience and technological advances.

Ares I is an in-line, two-stage rocket topped by the Orion crew exploration vehicle, its service module and a launch abort system.

The combination of the rocket's configuration and Orion's launch abort system, which can move astronauts away quickly in case of a launch emergency, will improve crew safety.



Concept image of launch of Ares I. (NASA/MSFC)

The launch vehicle's first stage is a single, five-segment reusable solid rocket booster, derived from the Space Shuttle Program's four-segment reusable solid rocket booster, that burns a specially formulated and shaped solid propellant called polybutadiene acrylonitrile (PBAN). A newly designed forward adapter will mate the vehicle's first stage to the second, and will be equipped with booster separation motors to disconnect the stages during ascent.

NASAfacts

The second, or upper, stage is being designed at Marshall. Much like the upper stage for the Ares V cargo launch vehicle, the Ares I upper stage is propelled by a J-2X main engine fueled with liquid oxygen and liquid hydrogen. The J-2X is an evolved variation of two historic predecessors: the powerful J-2 upper-stage engine that propelled the Apollo-era Saturn 1B and Saturn V rockets to the moon and the J-2S, a simplified version of the J-2 developed and tested in the early 1970s.

The primary mission of Ares I—and it's 50,000-pound payload capacity—is to carry crews of up to six astronauts to Earth orbit.

During the first two-and-a-half minutes of flight, the first stage booster powers the vehicle to an altitude of about 191,000 feet (38 miles) and a speed of Mach 5.9. After its propellant is spent, the reusable booster separates and the upper stage's J-2X engine ignites and powers the Orion spacecraft to an altitude of about 439,700 feet (83 miles). Then, the upper stage separates and Orion's service module propulsion system completes the trip to a circular orbit 976,800 feet (185 miles) above Earth.

Once in orbit, the Orion and its service module will rendezvous and dock either with the space station or with a lunar landing craft and Earth departure stage that will send the astronauts on their way to the moon.

The first Ares I test flight, known as Ares I-X, is planned for 2009. Crew transportation to the space station is planned to begin in 2015. The first lunar excursion is scheduled for the 2020 timeframe.

Ares I Team, Partners

The Ares I effort and associated hardware and propulsion element teams are led by the Exploration Launch Projects Office at Marshall, on behalf of the Constellation Program, hosted by NASA's Johnson Space Center in Houston, and NASA's Exploration Systems Mission Directorate in Washington.

Participating agency facilities include NASA's Johnson Space Center, which is responsible for the Orion spacecraft and flight operations

projects; Stennis Space Center near Bay St. Louis, Miss., which is primarily responsible for J-2X testing; NASA Glenn Research Center, which is responsible for developing the Ares I-X upper stage mass simulator and upper stage power, thrust vector control and sensor development; NASA's Langley Research Center in Hampton, Va., which is responsible for aerodynamic characterization, Ares I-X flight test vehicle integration and Orion mass simulator development, and support to flight mechanics and structure development; NASA's Ames Research Center in Sunnyvale, Calif., which is responsible for integrated health monitoring, blast modeling and reliability analysis support; NASA's Michoud Assembly Facility in New Orleans, which will manufacture and assemble the Ares I upper stage; and NASA's Kennedy Space Center, Fla., which is home to all Constellation launch operations and associated ground activities.

ATK Launch Systems of Brigham City, Utah, is the prime contractor for the first stage. Pratt & Whitney Rocketdyne in Canoga Park, Calif., is the prime contractor for the Ares I upper stage J-2X engine.

